INVESTIGATOR'S ANNUAL REPORT

United States Department of the Interior

National Park Service

All or some of the information you provide may become available to the public.

OMB # (1024-0236)
Exp. Date (11/30/2010)
Form No. (10-226)

Reporting Year:	**Park:**	**Select the type of permit this report addresses:**
2007	Shenandoah NP	Scientific Study

Name of principal investigator or responsible official:	**Office Phone:**
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Project Title (maximum 300 characters):

Determining natural erosion rates of Shenandoah National Park

Park-assigned Study or Activity #:	**Park-assigned Permit #:**	**Permit Start Date:**	**Permit Expiration Date:**
SHEN-00322	SHEN-2006-SCI-0003	Apr 01, 2006	Apr 01, 2008

Scientific Study Starting Date:	**Estimated Scientific Study Ending Date:**
Apr 01, 2006	Apr 01, 2008

For either a Scientific Study or a Science Education Activity, the status is:

Continuing

For a Scientific Study that is completed, please check each of the following that applies:

__ A final report has been provided to the park or will be provided to the park within the next two years

__ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park

__ All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed

Activity Type:

Research

Subject/Discipline:

Geology / General

Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):

The primary objective of this research is to understand the erosion of the Appalachian Mountains as a whole, and more specifically the erosion of the Blue Ridge Province in and around the Shenandoah National Park. This study is part of a larger National Science Foundation project focused on the erosion of the Appalachian Mountains and a US Geological Survey effort to improve mapping of the geology of the Shanadoah National Park. The research involves collection of samples (collected in four lithologies present in the

park: metabasalt, quatzite, siliclastic and granitic rocks) of river and stream sediment and samples of exposed bedrock in remote locations in the park, for cosmogenic analysis of 10Be. By measuring the concentration of this isotope in such samples, we will be able to estimate the rate at which both individual rock outcrops and drainage basins as a whole are eroding and generating sediment. This work will generate data useful for interpretation of Park natural resources to both scientific and lay audiences.

Findings and status of Scientific Study or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):

During 2007, further progress in this research includes: (1) collection of a further ~14, one- or two-liter samples of river and stream sediment and ~5 smaller (<1 kg) samples of exposed bedrock; (2) laboratory processing of 55 samples for isolation of 10Be, and measurement of these samples on the accelerator mass spectrometer (AMS) at the Scottish Universities Environmental Research Centre Accelerator Mass Spectrometry Laboratory. The AMS measured sample concentrations were modeled and the following average 10Be derived erosion rates were derived: Metabasalt â 13.2 m/My; Quatzite â 8.0 m/My; Granite â 15.6 m/My; and Siliciclastic â 10.9 m/My. The data suggests: (1) Analysis of 10Be concentrations in samples from each lithology separated in to four grain-size splits (0.25-0.85 mm. 0.85-2 mm, 2-10 mm, > 10 mm) suggest that there is no consistent relationship between grain-size and 10Be concentration, such as found in the work of Matmon et al., 2003. (2) When examining the erosion rate/slope relationship, there is no statistically significant difference between lithologies in the Shenandoah Park, except in the case of quartzite (which exhibits a strong positive correlation and is statistically different than granite), which suggests that differences in lithology do not generally affect basin-scale erosion rate; (3) No significant correlations have been determined from examination of the erosion rate/basin area and slope/basin area relationships for any of the lithologies. (4) Cosmogenically-determined erosion rates in Shenandoah Park are similar to or lower than those reported elsewhere in the Appalachians including those of Matmon et al. (2003), 25 to 30 m/My for meta-sandstone in the steep Great Smoky Mountains, Reuter et al. (2004), 4 â 54 m/My in Susquehanna River basin for shale, sandstone, and schist, and Sullivan et al. (2007), 6.5 â 38 m/My in the schist of the Blue Ridge Escarpment. (5) Short-term cosmogenic erosion rates (10^4 yrs) in the Blue Ridge of Shenandoah Park are consistent with long term rates (>10^7 yrs) estimated using U/Th/He near the Blue Ridge Escarpment by Spotila et al. (2004), 11 to 18 m/My, and using fission tracks in the southern Appalachians by Naeser et al. (2005), 20 m/My. This consistency suggests long-term rates of erosion of the region are steady and are reflected by the cosmogenic data.

For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?

Yes

If "Yes", identify where the specimens currently are stored:

University of Vermont

Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount):	**Funding specifically used in this park this reporting year that was provided by all other sources (enter dollar amount):**
$0	$25000

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year:

Paperwork Reduction Act Statement: A federal agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. Public reporting for this collection of information is estimated to average 1.625 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the forms. Direct comments regarding this burden estimate or any aspect of this form to Dr. John G. Dennis, Natural Resources (3127 MIB), National Park Service, 1849 C Street, N.W., Washington, DC 20240.